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No. 8 October 1986

THE MEASUREMENT OF ATTRIBUTABLE RISK: A USEFUL TOOL FOR HEALTH ADMINISTRATORS

by

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Health planners and program managers are often faced with the task of devising some algorithm by which monies will be allocated or a particular prevention/intervention strategy will be focused in order to reduce some unwanted outcome, for example, teenage pregnancy, infant mortality, inadequate prenatal care, or death from a certain cause. The following methodology is not meant to replace the allocation formulae that now exist in the Division of Health Services. Rather, this paper is of an exploratory nature, suggesting that standard quantitative epidemiologic tools may also be used for administrative purposes, albeit that the present approach will not be a panacea for all situations.

Unfavorable rates or large numbers of the unwanted outcome may be considered separately, but inequities may follow either one of these two aspects taken alone. Should counties with large numbers of the unwanted outcome always be funded at the highest levels? Should a small county receive the largest share because it has the worst rate? Should younger and older women necessarily be the focus of infant death interventions because their infants have the higher death rates?

An entity known as "attributable risk" combines the urgency of an unfavorable rate with the frequency of the unwanted outcome. This measure was originally defined by Levin (1,2) and indicates the proportion of the unwanted outcome that is attributable to an "exposure," say living in a particular county, working in a particular occupation, or possessing a certain personal characteristic.

Attributable Risk (AR) is expressed as

$$AR = \frac{e\,(RR-1)}{e\,(RR-1) + 1}$$

where e is the proportion of the entire population that is exposed and RR is the relative risk, i.e., the ratio of the fraction (f_1) of those ***exposed*** who experienced the outcome and the fraction (f_0) of those ***unexposed*** who experienced the outcome, that is, $RR = f_1/f_0$. By multiplying the result of the AR computation by 100, AR is expressed as a percentage. [Note: The parameter AR has been termed "population attributable risk" and "etiologic fraction" by some authors. We follow Walter (3) and express AR as a percentage.]

Lilienfeld and Lilienfeld (4) provide additional description of attributable risk including standard errors and confidence limits. Walter (3) provides a comprehensive statistical review of this and related epidemiological indices.

The preceding formula is appropriate for prospective data. However, in state health department settings, cross-sectional and retrospective designs are often used. The first two examples that follow involve prospective and cross-sectional data, both yielding estimates of rates. Their use in calculating relative risk is described in Appendices 1 and 2. The third example uses data from a retrospective design for which relative risk is approximated. These details are illustrated in Appendix 3.

Example 1. Infant Deaths Due to Cause X: A Prospective Design Application (see Appendix 1)

Scenario: A state-level prevention/intervention program wishes to expand its efforts among women whose infants contribute the most to Cause X deaths. The following data for race and maternal age groups represent live-birth cohorts and their corresponding numbers of infant deaths with resulting measures of risk:

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